

### CLAIMS

1. Use of at least one element chosen from among yttrium, zirconium, lanthanum, cerium, praseodymium and neodymium, in the form of oxides or salts, as reinforcing agent for the anticorrosion properties of a coating composition containing a particulate metal, in aqueous or organic phase, for metal parts.
- 5 2. Use according to claim 1, characterized in that one of the above-cited elements as anticorrosion property reinforcing agent is associated with molybdenum oxide  $\text{MoO}_3$ .
3. Use according to any of claims 1 or 2, to reinforce the efficacy of the anticorrosion protection imparted by the particulate metal, the latter preferably being  
10 added to the composition in powder form of varying geometric structure, homogenous or heterogeneous, in particular of spherical, lamellar or lenticular structure.
4. Use according to any of claims 1 to 3, characterized in that the element used is yttrium, preferably in the oxide form  $\text{Y}_2\text{O}_3$ , or in the form of yttrium  
15 carbonate.
5. Use according to claim 4, characterized in that yttrium oxide  $\text{Y}_2\text{O}_3$  is used in the form of particles having a size of between  $1\text{ }\mu\text{m}$  and  $40\text{ }\mu\text{m}$  with a  $D_{50}$  of less than  $3\text{ }\mu\text{m}$ .
6. Use according to any of claims 1 to 3, characterized in that the  
20 element used is cerium, preferably in the form of cerium chloride or in the oxide form  $\text{CeO}_2$ .
7. Use according to any of claims 1 to 3, characterized in that the element used is  $\text{La}_2\text{O}_3$ ,  $\text{Pr}_6\text{O}_{11}$ ,  $\text{Nd}_2\text{O}_3$  or  $\text{ZrO}_2$ .
8. Use according to any of claims 2 to 7, characterized in that  
25 molybdenum oxide  $\text{MoO}_3$  is used in an essentially pure orthorhombic crystalline form having a molybdenum content greater than approximately 60 % by weight.
9. Use according to any of claims 2 to 8, characterized in that the molybdenum oxide  $\text{MoO}_3$  is in the form of particles having a size of between  $1\text{ }\mu\text{m}$  and  $200\text{ }\mu\text{m}$ .

10. Use according to any of claims 2 to 9, characterized in that said anticorrosion property reinforcing agent is associated with molybdenum oxide  $\text{MoO}_3$  in a weight proportion of  $0.25 < \text{anticorrosion property reinforcing agent} : \text{MoO}_3 < 20$ , preferably  $0.5 < \text{anticorrosion property reinforcing agent} : \text{MoO}_3 < 16$ , further preferably  $0.5 < \text{anticorrosion property reinforcing agent} : \text{MoO}_3 < 14$ .

11. Anticorrosion coating composition for metal parts, characterized in that it contains:

- at least one particulate metal;
- a reinforcing agent for the anticorrosion properties of the composition chosen from among yttrium, zirconium, lanthanum, cerium, praseodymium and neodymium, in the form of oxides or salts;
- a binder; and
- either water optionally associated with one or more organic solvents, or one or more inter-miscible organic solvents,

12. Composition according to claim 11, characterized in that the reinforcing agent for the anticorrosion properties of the composition is associated with molybdenum oxide  $\text{MoO}_3$ .

13. Composition according to claim 12, characterized in that it contains 0.5 % to 2 % by weight molybdenum oxide  $\text{MoO}_3$ .

14. Composition according to any of claims 11 to 13, characterized in that it contains 10 % to 40 % by weight of at least one particulate metal.

15. Composition according to any of claims 11 to 14, characterized in that the particulate metal is chosen from among zinc, aluminium, tin, manganese, nickel, their alloys, and their mixtures.

16. Composition according to any of claims 11 to 15, characterized in that the particulate metal is chosen from among zinc, aluminium, their alloys and their mixtures.

17. Composition according to any of claims 11 to 16, characterized in that it contains 0.5 % to 10 % by weight of said reinforcing agent for the anticorrosion properties of the composition, preferably from 1 % to 8 % by weight, further preferably from 1 to 7 % by weight, relative to the weight of the composition.

18. Composition according to any of claims 11 to 17, characterized in that the reinforcing agent for the anticorrosion properties of the composition is yttrium, preferably in the oxide form  $Y_2O_3$  or in the form of yttrium carbonate.

5 19. Composition according to any of claims 11 to 18, characterized in that the reinforcing agent for the anticorrosion properties of the composition is cerium, preferably in the form of cerium chloride or in the oxide form  $CeO_2$ .

20. Composition according to any of claims 11 to 18, characterized in that the reinforcing agent for the anticorrosion properties of the composition is chosen among  $La_2O_3$ ,  $Pr_6O_{11}$ ,  $Nd_2O_3$  and  $ZrO_2$ .

10 21. Composition according to any of claims 11 to 19, characterized in that said reinforcing agent for the anticorrosion properties of the composition is associated with molybdenum oxide  $MoO_3$  in a weight proportion  $0.25 < \text{anticorrosion property reinforcing agent} : MoO_3 < 20$ , preferably  $0.5 < \text{anticorrosion property reinforcing agent} : MoO_3 < 16$ , further preferably  $0.5 < \text{anticorrosion property reinforcing agent} : MoO_3 < 14$ .

22. Composition according to any of claims 11 to 21, characterized in that it contains 3 % to 20 % by weight of an organic binder and/or mineral binder, in aqueous or organic phase.

20 23. Composition according to any of claims 11 to 22, characterized in that the binder is chosen from among an alcoxylated silane, optionally organofunctionalised, a silicone resin, a colloidal silica, a silicate of sodium and/or potassium and/or lithium, a zirconate, a titanate, an epoxy resin, a phenoxy resin, an acrylic and their mixtures, optionally associated with a crosslinking agent of phenolic type, aminoplast type, or dicyandiamide type, or with an acid catalyst.

25 24. Composition according to claim 23, characterized in that the binder is an organo-functionalised silane such as  $\gamma$ -glycidoxypentyl-trimethoxysilane and  $\gamma$ -glycidoxypentyltriethoxysilane.

30 25. Composition according to any of claims 11 to 24, characterized in that it contains an organic solvent chosen from among white spirit, alcohols, ketones, aromatic solvents and glycol solvents such as glycol ethers, in particular diethyleneglycol, triethyleneglycol and dipropyleneglycol, acetates, polyethyleneglycol and nitropropane, and their mixtures.

26. Composition according to any of claims 11 to 25, characterized in that it also contains up to 7 % by weight of a thickening agent.

27. Composition according to any of claims 11 to 26, characterized in that the thickening agent is chosen from among cellulose derivatives such as hydroxymethyl-cellulose, hydroxyethylcellulose, hydroxypropylcellulose or hydroxypropylmethylcellulose, xanthane gum, associative thickeners of polyurethane or acrylic type, silicas, silicates such as silicates of magnesium and/or lithium optionally treated, or organophilic clays, and their mixtures.

28. Composition according to any of claims 11 to 27, characterized in that it also contains a lubricating agent to obtain a self-lubricated system chosen from among polyethylene, polytetrafluoroethylene, MoS<sub>2</sub>, graphite, polysulfones, synthetic or natural waxes and nitrides, and their mixtures.

29. Composition according to any of claims 11 to 28, characterized in that it also contains an additive chosen from among an antifoam agent, a wetting agent, a surfactant and a biocide.

30. Composition according to any of claims 11 to 29, characterized in that it contains:

- 10 % to 40 % by weight of at least one particulate metal;
- 0.5 % to 10 % of a reinforcing agent for the anticorrosion properties of the composition chosen from among yttrium, zirconium, lanthanum, cerium, praseodymium and neodymium, in the form of oxides or salts, optionally associated with molybdenum oxide MoO<sub>3</sub>;
- up to 7 % by weight of a thickener;
- 3 % to 20 % by weight of a binder;
- up to 3 % by weight, preferably between 0.05 % and 2 % by weight of a sodium and/or potassium and/or lithium silicate;
- up to 7 % by weight of one or more lubricating agents;
- 1 % to 30 % by weight of an organic solvent or a mixture of organic solvents, and
- water to make up to 100 %

31. Composition according to claim 30, characterized in that it also contains 0.1 % to 10 % by weight of a weak mineral acid such as boric acid.

32. Composition according to either of claims 30 or 31, characterized in that it also contains 0.01 % to 1 % by weight of an anionic surfactant.

33. Anticorrosion coating for metal parts, characterized in that it is obtained from a coating composition according to any of claims 11 to 31, by spraying, dip-draining or dip-centrifuging, the coating layer being subjected to a baking operation by convection or infrared for example, preferably conducted at a temperature of between 79°C and 350°C, for approximately 10 to 60 minutes, by convection.

34. Anticorrosion coating for metal parts according to claim 33, characterized in that prior to a baking operation, the coated metal parts are subjected to a drying operation, by convection or infrared for example, in particular by convection at a temperature in the region of 70°C for approximately 10 to 30 minutes on line.

35. Anticorrosion coating for metal parts according to either of claims 33 to 34, characterized in that it is applied to the metal parts to be protected with a dry film thickness of between 3  $\mu\text{m}$  (11  $\text{g/m}^2$ ) and 15  $\mu\text{m}$  (55  $\text{g/m}^2$ ), preferably between 4  $\mu\text{m}$  (15  $\text{g/m}^2$ ) and 10  $\mu\text{m}$  (40  $\text{g/m}^2$ ), further preferably between 5  $\mu\text{m}$  (18  $\text{g/m}^2$ ) and 10  $\mu\text{m}$  (40  $\text{g/m}^2$ ).

36. Metal substrate, preferably in steel, provided with an anticorrosion coating according to any of claims 3 to 35.

37. Substrate according to claim 36, characterized in that the anticorrosion coating is itself coated with another coating comprising an alkaline silicate, in particular a sodium and/or potassium and/or lithium silicate, an acrylic, a zirconate, a titanate, a silane, an epoxy resin, a phenol resin or one of their mixtures, these resins optionally being associated with a colloidal silica.

38. Substrate according to claim 36, characterized in that the anticorrosion coating is itself coated with another coating comprising a lubricating agent chosen from among polyethylene, polytetrafluoroethylene,  $\text{MoS}_2$ , graphite, polysulfones, synthetic or natural waxes and nitrides and their mixtures.